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ABSTRACT

The object of this study was to find out whether learning process and reading variables predict first-year grade point average (GPA) in college. The learning process variables were: (1) deep learning; (2) surface learning; and (3) achievement orientation. Reading variables dealt with factual and inferential knowledge. Also examined was whether these variables retain independent predictive values when used in combination with other predictors such as high school rank, American College Testing scores, and Scholastic Aptitude Test (SAT) and Preparatory SAT scores. The Biggs Study Process Questionnaire, a short article, and a set of multiple-choice questions about the article were administered to 60 female and 41 male first-year students in their second semester at a small liberal arts college. Achievement orientation and inferential knowledge predicted 28.7% of the GPA variance. Multiple regression analyses showed that learning process and reading variables (mainly achievement orientation and inferential knowledge) are significant independent predictors of first-year college GPA, even when used in combination with standardized tests, high school rank, or a combination of both. These results were discussed in terms of admission, retention, and curricular policies. (Author/SLD)

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Ten Percent More:
What Learning Process Dimensions can add to the Prediction of First Year College Students' Academic Success.

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Abstract

The object of this study was to find out whether learning process variables (deep learning, surface learning, and achievement orientation) and reading variables (factual and inferential knowledge) predict first-year grade point average (GPA) in college, and retain independent predictive value when used in combination with other predictors such as high school rank, American College Testing scores (ACT), Scholastic Aptitude Testing scores (SAT and PSAT). The Biggs Study Process Questionnaire, a short article, and a set of multiple choice questions about the article were administered to 101 first year students. Achievement orientation and inferential knowledge predicted 28.7% of the GPA variance. Multiple regression analyses showed that learning process and reading variables (mainly achievement orientation and inferential knowledge) are a significant independent predictor of first-year college GPA, even when used in combination with standardized tests, high school rank, or a combination of both. These results were discussed in terms of admission, retention, and curricular policy.

Ten Percent More:
What Learning Process Dimensions can add to the Prediction of First Year College Students' Academic Success.

Some studies show that learning process variables such as depth in processing correlate with academic achievement (Brown and Nelson, 1983; Bruch, Pearl, and Giordano, 1986), and other studies demonstrate that high school rank and standardized tests are predictive of college GPA (Willingham, 1985). However, there are few studies that address the question of whether learning process variables have independent predictive value, that is to say whether they add anything to the predictive power of standard predictor variables such as high school rank and standardized tests like the Standard Achievement Test (SAT), the Preparatory Standard Achievement Test (PSAT), and the American College Testing Assessment (ACT).

The relationship between the predictive power of learning process variables and that of standard predictors of academic success in college is largely unexplored. Only one study was found that addressed this issue, using the scales of the Inventory of Learning Processes (ILP) and ACT scores to predict academic success in college (Schmeck, 1979). The general finding of the study was that "fact retention" and "elaborative processing" have a direct effect upon college grade point average, independently of ACT scores.

In this study, Schmeck, studying a general undergraduate sample, found the following correlations between GPA and various

predictors: ACT, .35; fact retention, .20; synthesis/analysis, .23; elaborative processing, .15. A path analysis showed that, of these predictors, the ones with direct effects on the GPA were ACT (.32), fact retention (.13), and elaborative processing (.08).

While the path analysis coefficients between elaborative processing, fact retention, and GPA were not as large as those obtained from standard predictors (ACT), they are nevertheless significant and interesting to pursue. Fact retention and elaborative processing are predictors which do not represent past history (like high school rank), or achievement level (like ACT); rather, they represent reading strategies and learning style qualities which are present characteristics of the students.

Such indicators might be useful in assessing students with special educational histories or backgrounds, whose performance in college is not predicted well by standard predictors (Pedrini and Pedrini, 1977). In addition, characteristics such as learning style and reading strategy may be teachable, and if so, such research would open the possibility of cognitive or achievement modifiability in college.

Elaborative processing, one of the ILP scales, is defined by Schmeck (1979) as "the extent to which an individual is willing to translate new information and examples to fit into a personal organizational framework", and thus represents a type of strategy associated with the deep-processing of material (Craik and Lockhart, 1972). This approach is also reflected in the manner in which Biggs, in his Study Process Questionnaire (SPQ) , expresses

the deep learning strategy dimension: all the questions in that dimension deal with personal organization and application of the material learned.

The present research used the Biggs SPQ rather than the Schmeck ILP. The reason for this choice lies in the manner the instruments were constructed, the theoretical clarity of the dimensions used, and the population on which the instruments were developed.

The Schmeck ILP was developed using primarily students from Southern Illinois University , and the various dimensions of the ILP are the result of a factorial analysis based on the results of a group of 503 undergraduates (Schmeck, 1977). The factors were named after they were derived, and the factor name attempts to synthesize the content of the member items. Hence, the ILP factors are inductive in nature, and the labeling construct that interprets them is not always theoretically clear. On the basis of face validity alone, it is not always easy to predict which factor a given test item should belong to.

In contrast, the Biggs SPQ factors were developed around a given theoretical approach, and then refined through factorial analysis while maintaining the original guiding concepts (Biggs, 1978). Hence, the Biggs variables have greater theoretical coherence, and are easier to interpret. The Biggs questionnaire was developed and refined through testing involving large numbers of students throughout the Australian school system. The idea of linking some USA research with a large body of non-American English-speaking research was an interesting one, especially

since the Biggs SPQ had already been used in research at Stanford university (Biggs and Rihn, 1984).

The Biggs questionnaire embodies two theoretical orientations: the "level of processing" approach (Craik and Lockhart, 1972) which is related to the "surface" and "deep" dimensions of the questionnaire (each analyzed in "motives" and "strategies"), and a more pragmatic, task-centered approach reflected in the "achievement" dimension.

Previous research has found that deep processing is associated with higher academic performance (Brown and Nelson, 1983; Bruch, Pearl, and Giordano, 1986), a more structurally complex level of learning (Biggs, 1979, 1985), and higher levels of satisfaction with academic performance (Biggs, 1984, 1985). Students who enjoy learning , relate concepts to one another, and apply what they learn, obtain better grades, are more satisfied with their learning outcomes , and also are able to express their ideas in a more articulated and balanced form (as measured by the SOLO taxonomy).

Results concerning the achievement factor were less clear: Biggs found achievement strategies and motives significantly correlated to the deep processing dimension, and to academic success (Biggs, 1984; Biggs and Rihn, 1984). Students who see learning as a competitive challenge and organize themselves for efficiency enjoy learning more, learn with greater depth and obtain better grades than other students do. This does not always hold true however: Schmeck's "study method" factor -admittedly

more narrow- showed no correlation with GPA in college students (Schmeck, 1979).

It is possible that some of these conflicting results could be explained by sampling differences: all of the above studies used general undergraduate samples, without controlling for the students' level of college experience. Perhaps different strategies are important at various levels in one's academic career, and the samples might have contained differing proportions of novice and advanced students.

First-year college students are novice learners in relation to the demands of college life, and can thus be expected to differ in systematic ways from expert learners. Research for example shows that expert learners are better at discriminating the important elements in a passage they read (Spilich, Vonder, Chiesi, and Voss, 1979), and consequently, they are more adept at organizing their knowledge in a coherent structure (Just and Carpenter, 1984). Expert learners also tend to sort problems in terms of deep structure, while novice learners use surface structure as a criterion (Schoenfeld and Hermann, 1982). As a result, expert learners are better prepared to grasp similarities between concepts and draw analogical relationships.

The task of the novice learner is to acquire a sufficient knowledge base to learn the basic markers and strategies of her or his field of choice. The task of the expert learner is to refine the use of appropriate strategies and to build an increasingly more coherent view of things. It is therefore reasonable to expect that the learning process components

predictive of success in these two types of tasks would differ. Basic organization and assimilation skills such as those included in Bigg's achievement orientation variable might be more important in the beginning of one's college experience, while deep learning skills become increasingly crucial as learning advances.

Thus, one of the reasons for the variable results obtained in earlier research may be that the student samples contained varying proportions of beginning and advanced students. In a sample with a large number of first-year students, achievement orientation may be a significant predictor of success; in a sample weighted in favor of more advanced students, it might not. There are a number of studies that demonstrate that factors which are good predictors of first-year GPA, are increasingly less predictive in succeeding years (Willingham, 1985, pp 113-131).

Consequently, the study reported here limited itself to a first-year student population, and looked at the predictability of end of year GPA, both in terms of standard predictors (high school rank, standardized tests), and in terms of learning process components and reading strategies which, in some previous research, were shown to be related to academic success.

Method

Design and Procedure

Testing took place during one session. The Biggs Study Questionnaire was administered first, then the subjects read the Third Wave text, and finally, they answered questions relative to the text.

Subjects

The subjects were 101 first year students at a small liberal arts college (total population: 1,800). All students had been admitted in the Fall, and were in their second semester of study. The subjects were given the instruments during required first-year classes. In addition, there were 7 volunteer participants, recruited through a general mailing to first-year students. The sample contained 60 females and 41 males.

Measures

The Study Process Questionnaire (Biggs, 1979) is a 42-item Likert format questionnaire, containing 14 items pertaining to each of three approaches to learning: surface, deep, and achievement. In each set of 14 items, 7 concerned motives, and 7 concerned strategy related to the approach measured.

A learning task, composed of a text (The Third Wave, Psychology Today, 1976, July, p 14 -also used in Biggs, 1979-) followed by a set of multiple choice questions constructed in accordance with Bloom's taxonomy. Fifteen items measured factual knowledge, and 25 items focused on inferential skill (the comprehension, application, analysis, synthesis and evaluation steps of the taxonomy).

Cumulative college GPA (grade point average) scores, ACT (American College Testing) composite scores, high school rank, PSAT (scholastic aptitude test, junior form) scores, SAT scores, were obtained for these students from their college records. Not every score was available for every student, as shown in Table 1.

Results

A series of stepwise multiple regression analyses were performed, with GPA as the dependent variable. The rationale behind these analyses was first to study the role of ACT, high school rank, PSAT, SAT in predicting GPA, and then to add the study process variables (surface, deep, achievement) and the learning task variables (factual knowledge, inference). This approach would show whether any of these variables emerged as independent significant predictors of GPA.

Insert Table 1 about here

Three standardized tests can be used to predict the students' college performance: the ACT, the SAT, and the PSAT. Students do not in general take all of these. Many students take two of these tests, generally the PSAT and one other. In addition, there were a few students about whom high school rank data were not available. Hence the number of students included in each one of the analyses reported in table 1 varies.

For this sample, the best single predictors of first-year college GPA were the ACT and the high school rank, which predicted 40.0% and 40.5% of the GPA variance respectively. The predictivity afforded by the study process and reading measures (28.7% of the GPA variance) and the PSAT (27.5% of the GPA variance) are equivalent. The SAT is the least powerful predictor (15.2% of the GPA variance), which is perhaps due to the relatively small sample of students who took that test.

The predictivity of standardized college entrance tests was significantly enhanced by the additional information brought by study process and learning task variables (17.2% improvement for the ACT, 21.8% for the SAT, 15.9% for the PSAT). The achievement dimension of the Biggs questionnaire was the main enhancer; inferential and factual knowledge played a secondary role.

A similar increase in predictivity was observed after the high school rank information was added to the standardized test results (14.8% for the ACT, 25.6% for the SAT, 22.6% for the PSAT). When study process and learning style variables were added to the combination of standardized test and high school rank scores, GPA predictivity increased significantly again (10.3% for ACT-HS RANK, 12.1% for SAT-HS RANK, 5.3% for PSAT-HS RANK). The variables contributing to the increase in predictivity were the achievement, and to a lesser degree, the deep learning and inferential knowledge variables.

Correlations between learning style variables, learning task variables, and GPA are presented in table 2.

Insert table 2 about here.

The achievement and deep learning variables were highly correlated (.61), but their relation to the GPA differed: while both dimensions' correlations with GPA were significant, achievement's was significantly larger (Z=1.8, p (one tailed) <.05). The two learning task variables had comparable correlations with the GPA. It is notable that the surface

orientation to learning was unrelated to academic performance in the first year.

Discussion

The results of this study confirmed what is already well known: that standardized tests and high school rank are good predictors of college academic success. Past performance, past educational experiences are the best predictors of future performance and success.

Viewed by themselves, these results lead to a disheartening outlook on college student potential, where the future appears to be locked in by the past. Such an outlook may lead to admission policies that simply reinforce existing social stratification, as individuals in more fortunate personal circumstances generally have a more favorable educational history as well.

Using the past as a predictor of the future also discriminates against individuals with special educational histories and non normative backgrounds. For example, research has constantly shown that standardized tests and high school rank data are poor predictors of academic success for minority groups such as African and Hispanic Americans (Pedrini and Pedrini, 1977; Zarate, 1976). Hence, there is a need to find predictors of academic success that are relatively independent from traditional predictors. This study indicates that study process and learning task variables may be a domain in which such predictors can be found.

In this study, two variables were found to be most interesting in that regard: achievement orientation (Biggs), and

inferential knowledge. In the Biggs questionnaire, achievement orientation motivationally reflects a competitive attitude toward learning, characterized by a desire for excellence and a high valuing of grades. Behaviorally, it results in an organized approach to learning, emphasizing proper study habits, reading and note-taking strategies.

An achievement oriented person does not necessarily have an interest in learning per se, although this often happens (r between achievement and deep learning orientations = .61). One could be achievement oriented for surface, extrinsic reasons (r between achievement and surface orientations = .21). Achievement orientation, not the desire for knowledge, is what gives first year students an edge. Students interested in learning, but who do not do the required assignments or keep their notes in order will not be very successful, especially in a small liberal arts college where more papers, quizzes, and other assignments are required per course than in larger institutions.

It is possible that the achievement orientation advantage is primarily a first-year phenomenon: students with low achievement orientation may have a tendency to drop out, so that, for more advanced students, deep learning orientation becomes more predictive of success. One may wonder how "surface" achievers fare as juniors or seniors.

The second predictor variable, inferential knowledge, reflects the ability to comprehend, analyze, evaluate and apply material that is read. The relevance of this ability to academic success is not surprizing; had no connection been found, one

might worry, either about the validity of the measure, or about the state of higher education.

While achievement orientation and inferential knowledge may serve as additional screening tools less closely related to an individual's educational history, it is also true that both of these qualities are learned rather than innate. Thus programs could be designed to teach the students how to be more competitive, better organized, and more insightful readers, which presumably would increase their potential for academic success. One could envision college preparatory courses or retention programs making use of these ideas.

There is little question that helping students become more thoughtful readers is a worthy educational goal, but before attempting to turn beginning students into grade driven competitive achievers, one might pause. Certainly, organizational skills are worthwhile and helpful, and a bit of competition may be energizing; but if achievement orientation, rather than a love for learning, truly is the dimension that gives students an advantage, perhaps we ought to examine our curriculum and its philosophy. Is there a danger that too much reliance on measurable objectives and pre-ordained goals may breed conformity rather than insight? Perhaps competitors do better in our classes because our instructional methods bear more resemblance to obstacle courses than to socratic dialogues. If so, it may be time to modify the system rather than the students.

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Table 1

Prediction of GPA without and with study process and learning task variables.

Regressions High school predictors			Regressions adding surface, deep, achievement facts, inference variables.			Difference between models.)
Analyses	N	adj. r^2	adj. r^2	predictors	beta	(F values)
ACT	59	.400**	.572**	ACT	.456**	24.98**
				ACHIEVEMENT	.422**	
				INFERENCE	.160(.07)	
SAT	30	.152*	.370**	ACHIEVEMENT	.422**	11.66**
				SAT	.298(.07)	
				FACTS	.279(.09)	
PSAT	80	.275**	.434**	PSAT	.474**	20.49**
				ACHIEVEMENT	.392**	
HS RANK	92	.405**	.497**	HS RANK	.560**	17.52**
				ACHIEVEMENT	.320**	
ACT & HS RANK	57	.548**	.651**	HS RANK	.359**	17.82**
				ACHIEVEMENT	.331**	
				ACT	.281**	
				INFERENCE	.141(.09)	
SAT & HS RANK	26	.408**	.529**	HS RANK	.657**	7.16**
				DEEP	.367*	
PSAT & HS RANK	76	.501**	.554**	HS RANK	.440**	9.72**
				PSAT	.293**	
				ACHIEVEMENT	.254**	
(none)	101		.287**	ACHIEVEMENT	.484**	
				INFERENCE	.255**	

** p<.01 * p<.05

Table 2.

Pearson correlations between

independent predictors and GPA.

	GPA	Surf	Deep	Achi	Facts	Infer
GPA		.060	.271**	.486**	.199*	.258**
Surface orientation		-.089		.208*	-.147	-.051
Deep learning				.610**	.126	.056
Achievement orientation					.098	.007
Factual knowledge						.220*
Inferential knowledge						

**p<.01 * p<.05 N = 101